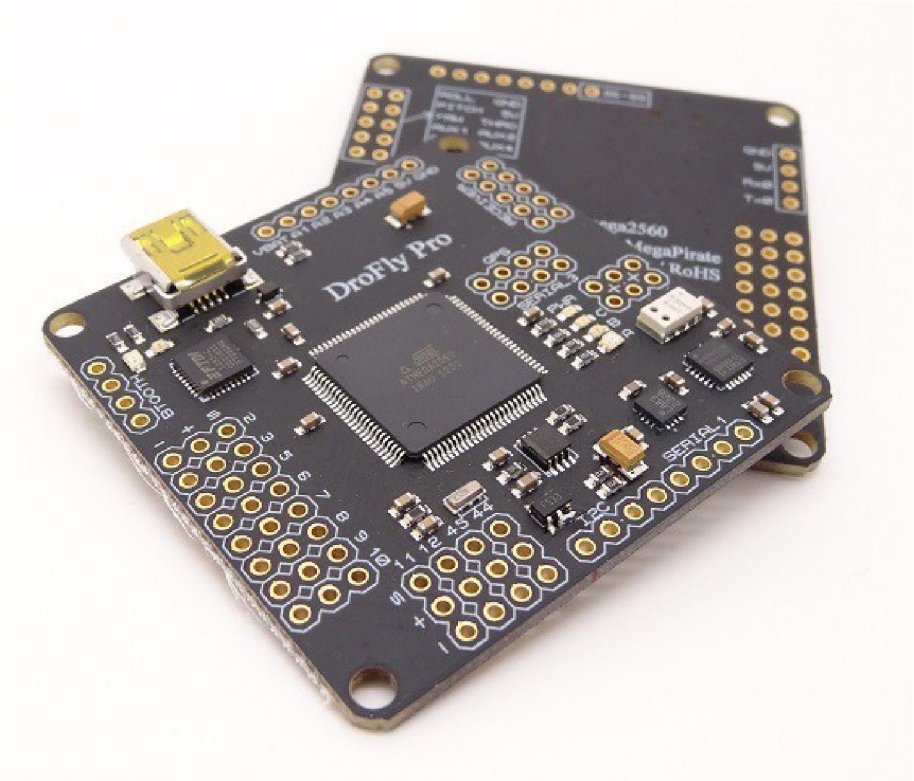
Drofly Pro
Flight Controller
-
MegaPirateNG
-
User manual



Version 1.0 - 01/08/13

DROTEK

Web shop: www.drotek.fr

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1. INTRODUCTION

The MegaPirateNG project focuses on porting ArduCopter2 open source project to IMU board.
MegaPirateNG now supports multiple sensors and IMUs.
More information available here:
http://code.google.com/p/megapirateng/

With this firmware it is possible to use the Mission Planer, created by Michael Oborne, which serve to setup the Arducopter hardware and by extension the DroflyPro with MegaPirateNg firmware.

This software does a lot more than its name. Here are some of the features:

- Point-and-click waypoint entry, using Google Maps.
- Select mission commands from drop-down menus
- Download mission log files and analyze them
- Configure APM settings for your airframe
- See the output from APM's serial terminal

Even if using MegaPirateNG is simple, even for a beginner, it requires a few hardware and software initial tasks.

This user manual will guide you through the basic steps to get your model flying.

This section will explain how to edit, setup and upload the MegaPirateNG code into your flight controller.

2. SOFTWARE INSTALL

Getting started with arduino software

As described in the introduction, MegaPirateNG project uses Arduino development platform.
This section will explain how to setup Arduino software on your computer in order to edit and upload MegaPirateNG code into your flight controller.

a. Download

Latest Arduino software version is available here:
http://arduino.cc/en/Main/Software

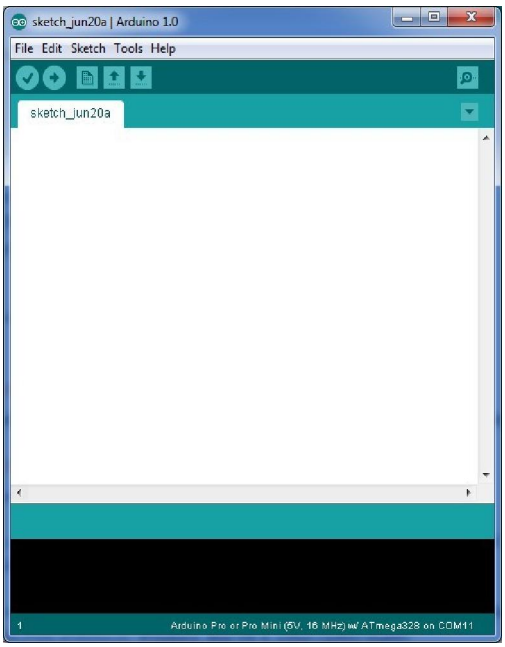
Select and download a V1.0x version available for your computer/operating system then extract the *zip* file.

The version 1.5x is not compatible with the MegaPirateNG code.

b. Install

Open the extracted folder and Open Arduino program (*arduino.exe* for Windows users).

This window will be displayed.


sketch_jun20a | Arduino 1.0
File Edit Sketch Tools Help
sketch_jun20a
1
Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega328 on COM11

Arduino software is now installed and ready to use on your computer.

Getting started with MegaPirateNG code

This section will explain how to tune MegaPirateNG code to fit your flying model.

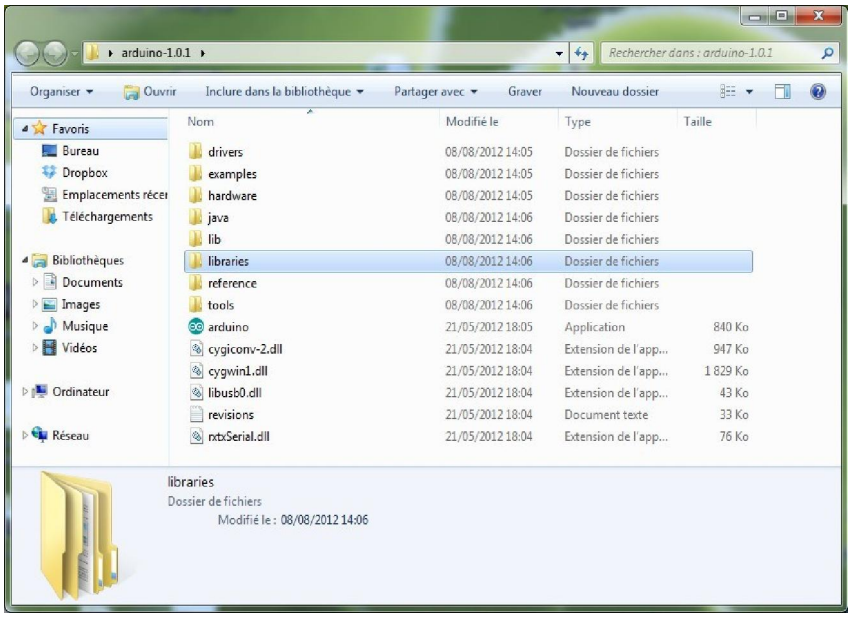
a. Download

Please download the latest version of the MegaPirateNG code available on this page:
https://code.google.com/p/megapirateng/downloads/list
The downloaded file should be named as follow:
"MegaPirateNG_xxx_Ry.zip"

b. Install

Extract it in a dedicated folder; 2 subfolders will be created:
- **ArduCopter** contains the code to be uploaded onto the flight controller
- **Libraries** contains all the software librairies.

Move the content of "Librairies" folder in the Arduino libraries folder.
Move too the "Arducopter" folder into the Arduino librairies folder.



Before editing the configuration file of the ArduCopter project, you must edit the following file "AP_InertialSensor_MPU6000_I2C.cpp" in the "Librairies\AP_InertialSensor" folder.

Search at line 145 the following code

```
   } else if (_board_Type == PIRATES_DROTEK_10DOF_MPU || _board_Type ==
PIRATES_CRIUS_AIO_PRO_V1 || _board_Type == PIRATES_CRIUS_AIO_PRO_V2) {

          _gyro_data_index[0]  = 5;     // Y

          _gyro_data_index[1]  = 4;     // X

          _gyro_data_index[2]  = 6;     // Z

          _gyro_data_sign[0]   = 1;     // Y

          _gyro_data_sign[1]   = 1;     // X

          _gyro_data_sign[2]   = -1;    // -Z


          _accel_data_index[0] = 1;

          _accel_data_index[1] = 0;

          _accel_data_index[2] = 2;

          _accel_data_sign[0]  = 1;

          _accel_data_sign[1]  = 1;

          _accel_data_sign[2]  = -1;

   }
```

And replace it with

```
   } else if (_board_Type == PIRATES_CRIUS_AIO_PRO_V1 || _board_Type ==
PIRATES_CRIUS_AIO_PRO_V2) {

          _gyro_data_index[0]  = 5;     // Y

          _gyro_data_index[1]  = 4;     // X

          _gyro_data_index[2]  = 6;     // Z

          _gyro_data_sign[0]   = 1;     // Y

          _gyro_data_sign[1]   = 1;     // X

          _gyro_data_sign[2]   = -1;    // -Z


          _accel_data_index[0] = 1;

          _accel_data_index[1] = 0;

          _accel_data_index[2] = 2;

          _accel_data_sign[0]  = 1;

          _accel_data_sign[1]  = 1;

          _accel_data_sign[2]  = -1;
```

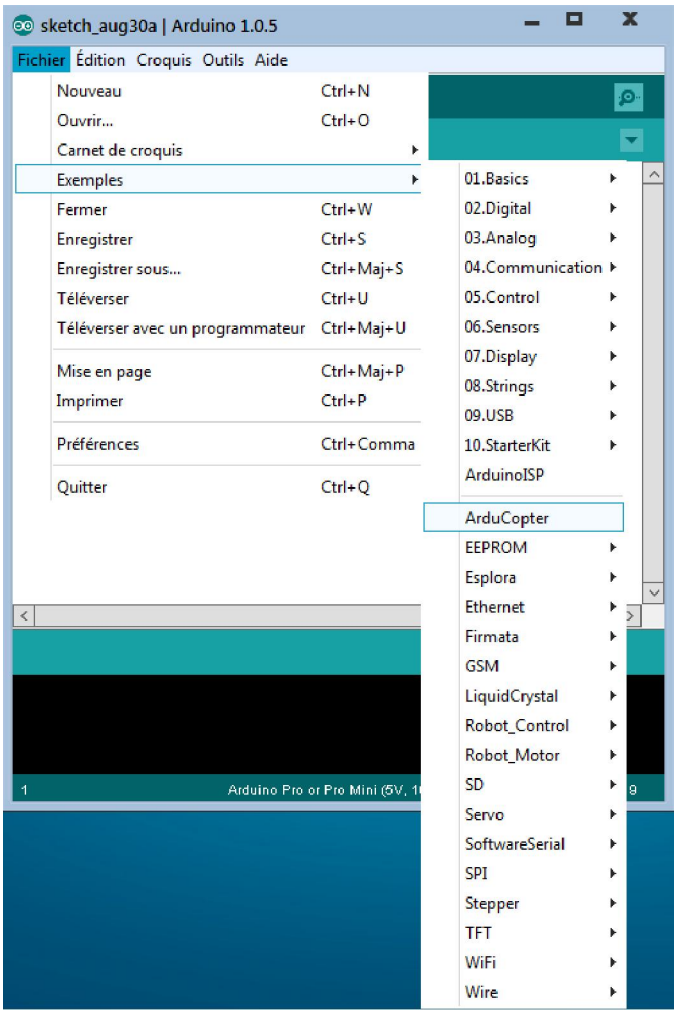
```
}else if (_board_Type == PIRATES_DROTEK_10DOF_MPU ) {
          _gyro_data_index[0]  = 4;     // X
          _gyro_data_index[1]  = 5;     // Y
          _gyro_data_index[2]  = 6;     // Z
          _gyro_data_sign[0]   = 1;     // X
          _gyro_data_sign[1]   = -1;    // Y
          _gyro_data_sign[2]   = -1;    // -Z

          _accel_data_index[0] = 0;
          _accel_data_index[1] = 1;
          _accel_data_index[2] = 2;
          _accel_data_sign[0]  = 1;
          _accel_data_sign[1]  = -1;
          _accel_data_sign[2]  = -1;
   }
```

And save the file.

The goal of this code is to adapt the sensor orientation of the Drofly Pro with the MegaPirateNG code.

Open Arduino program (*arduino.exe* for Windows users).
Open the *File* menu, in the *Examples* section. You must see the Arducopter in the list.



Click on ArduCopter. it opens the full project code.

MegaPirateNG setup: APM_Config.h file

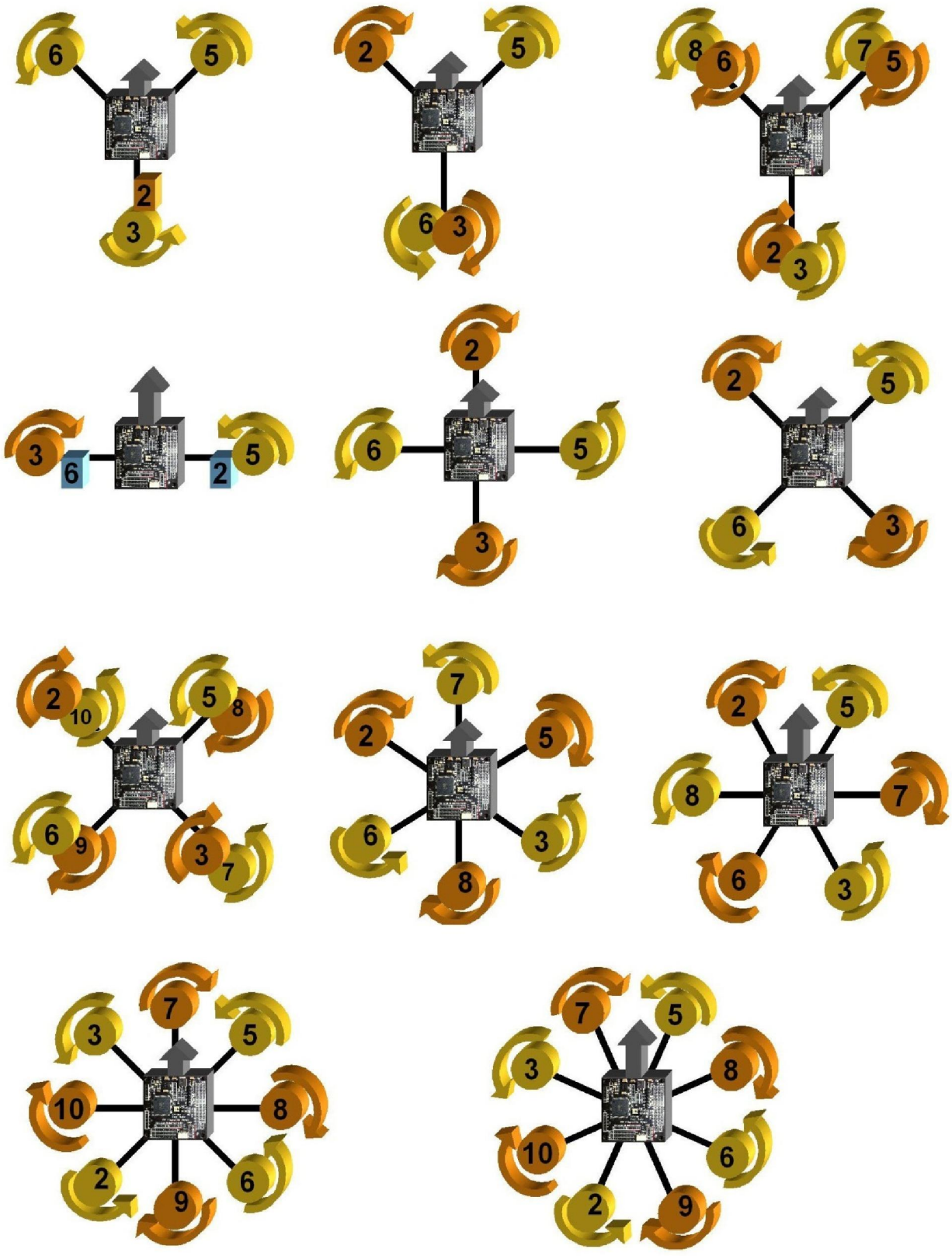
The MegaPirateNG code is splitted in several files, displayed in different tabs in Arduino. Each one of them is dedicated to a specific functionality (radio, commands, motors, etc…).
APM_Config.h is the parameters file to be edited in order to fit your flying model.

WARNING: Do NOT modify other files unless you're an advanced user.

Click on the APM_C**onfig.h** tab to enter the code.

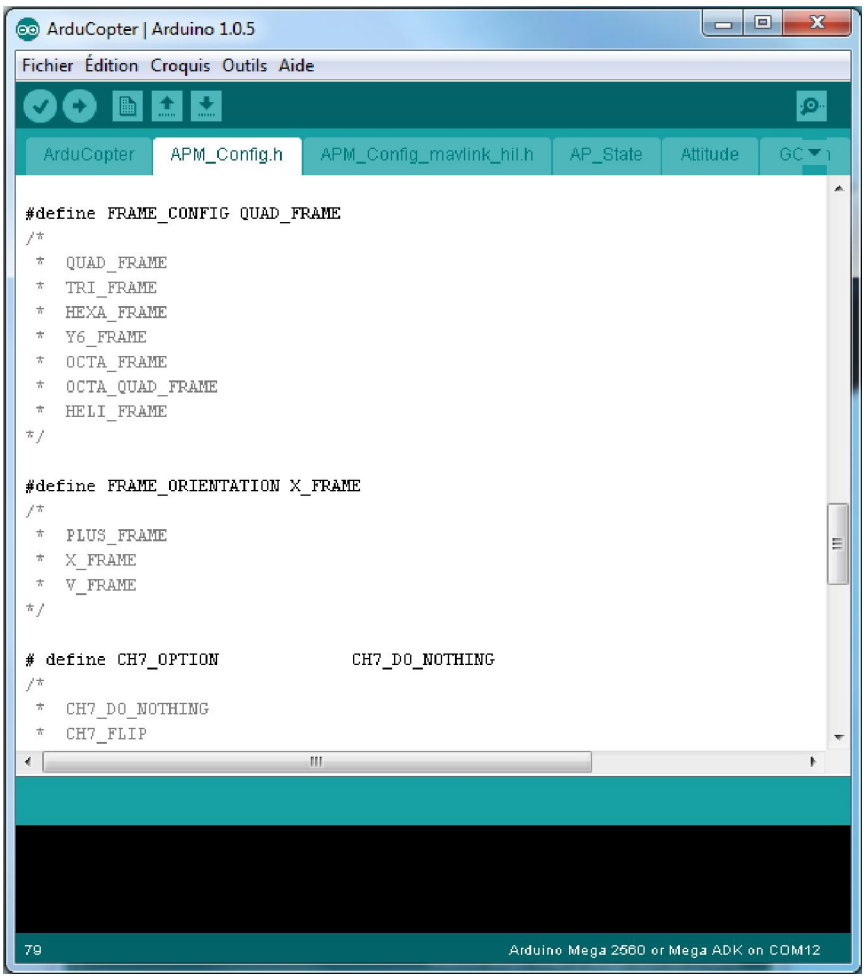
a. **Flight controller selection**
   #define PIRATES_SENSOR_BOARD PIRATES_DROTEK_10DOF_MPU

b. **Number of motors**
   Multicopter models can take numerous different designs and number of motors.
   MegaPirateNG code can handle all the listed types of models:


6 5 2 3
2 5 6 3
8 6 7 5 2 3
3 6 2 5
2 6 5 3
2 5 6 3
2 10 5 8 6 9 3 7
7 2 5 6 3 8
2 5 8 7 6 3
7 3 5 10 8 2 9 6
7 5 3 8 10 6 2 9

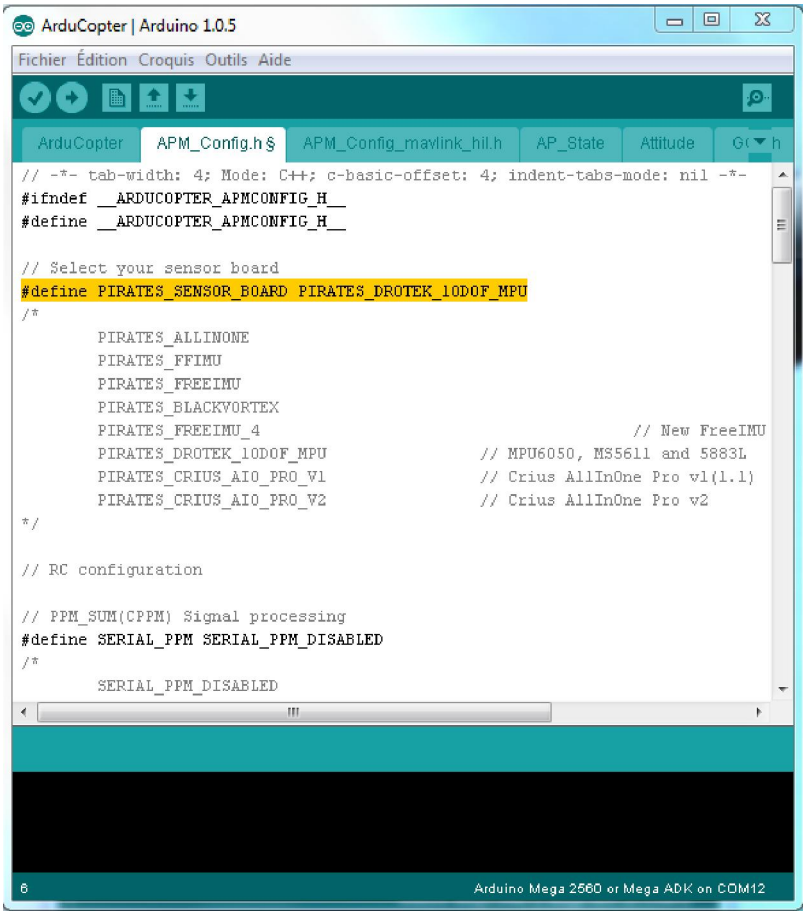
Identify the type of model you need then uncomment the relevant line in the code (just remove // at the beginning of the line).

Example, for a quadricopter X (2 front motors, 2 rear motors):
#define FRAME_CONFIG QUAD_FRAME
#define FRAME_ORIENTATION X_FRAME



c. Flight controller selection

Now, you need to select the type of flight controller you are using.
#define PIRATES_SENSOR_BOARD PIRATES_DROTEK_10DOF_MPU



The MegaPirateNG code is now ready to be uploaded into your flight controller.

Please note this user manual describes only the basics of MegaPirateNG code. Additional parameters (rx type, gimbal parameters, etc…) can be fine-tuned in the **APM_Config.h** file.

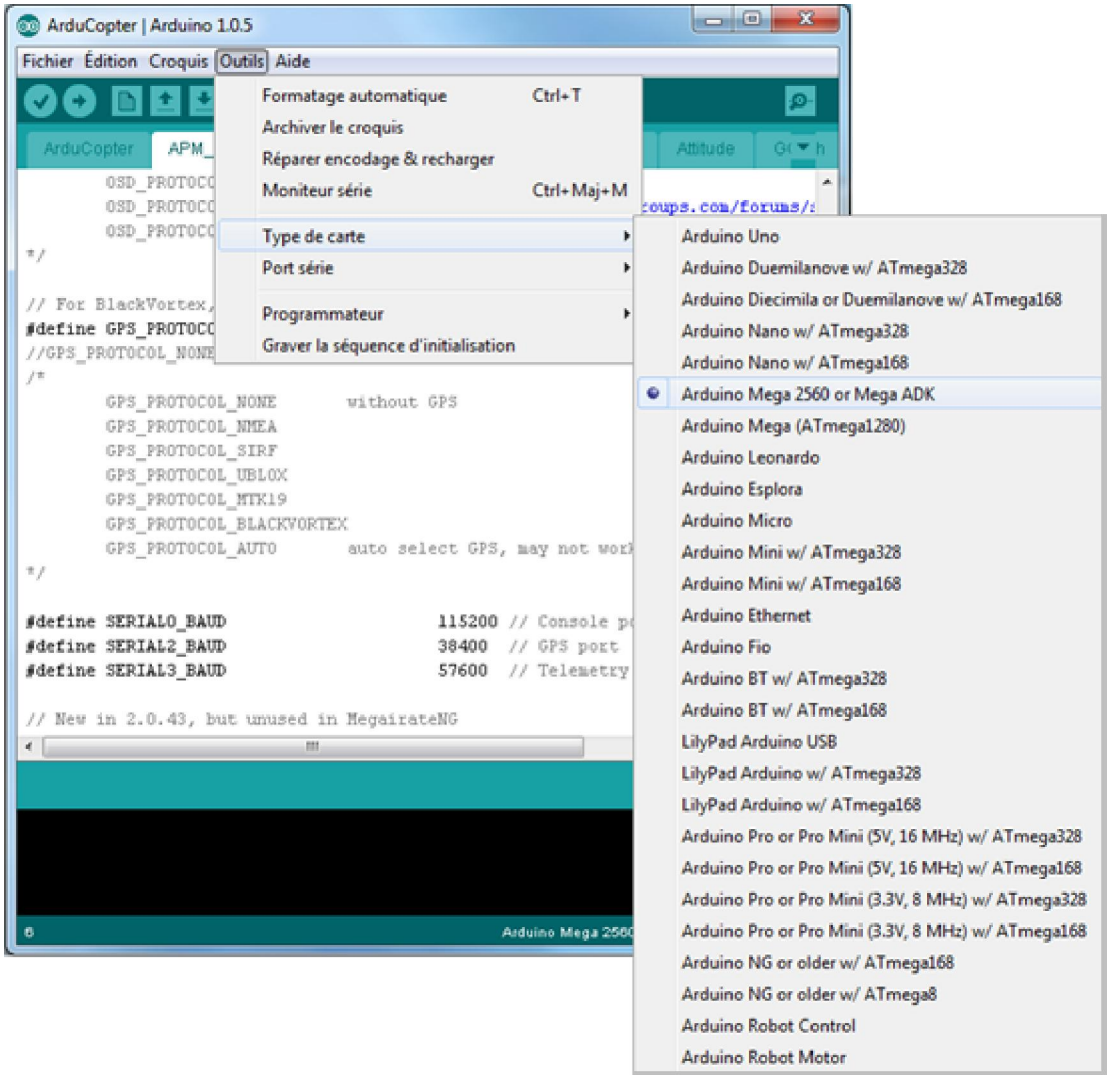
Please refer to the MegaPirateNG Wiki for further details:
https://code.google.com/p/megapirateng/wiki/GettingStarted?tm=6

Uploading MegaPirateNG code into flight controller

In order to compile and upload the code into the flight controller, you need to select :

-the type of board:

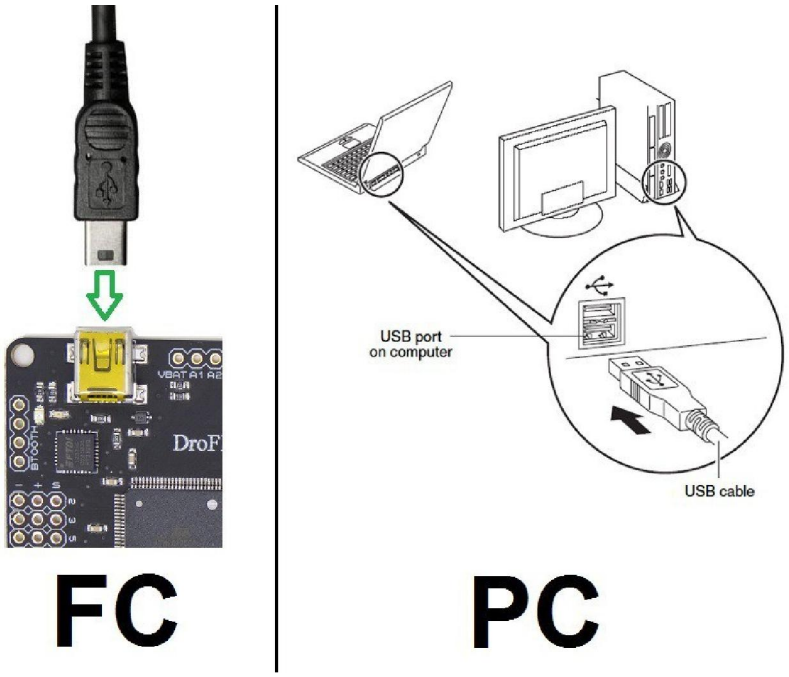
In Arduino program: Tools>>Board>>Arduino Mega 2560


ArduCopter | Arduino 1.0.5
Fichier Édition Croquis Outils Aide
Formatage automatique Ctrl+T
Archiver le croquis
Réparer encodage & recharger
Moniteur série Ctrl+Maj+M
Type de carte
Port série
Programmateur
Graver la séquence d'initialisation
Arduino Uno
Arduino Duemilanove w/ ATmega328
Arduino Diecimila or Duemilanove w/ ATmega168
Arduino Nano w/ ATmega328
Arduino Nano w/ ATmega168
Arduino Mega 2560 or Mega ADK
Arduino Mega (ATmega1280)
Arduino Leonardo
Arduino Esplora
Arduino Micro
Arduino Mini w/ ATmega328
Arduino Mini w/ ATmega168
Arduino Ethernet
Arduino Fio
Arduino BT w/ ATmega328
Arduino BT w/ ATmega168
LilyPad Arduino USB
LilyPad Arduino w/ ATmega328
LilyPad Arduino w/ ATmega168
Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega328
Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega168
Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega328
Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega168
Arduino NG or older w/ ATmega168
Arduino NG or older w/ ATmega8
Arduino Robot Control
Arduino Robot Motor

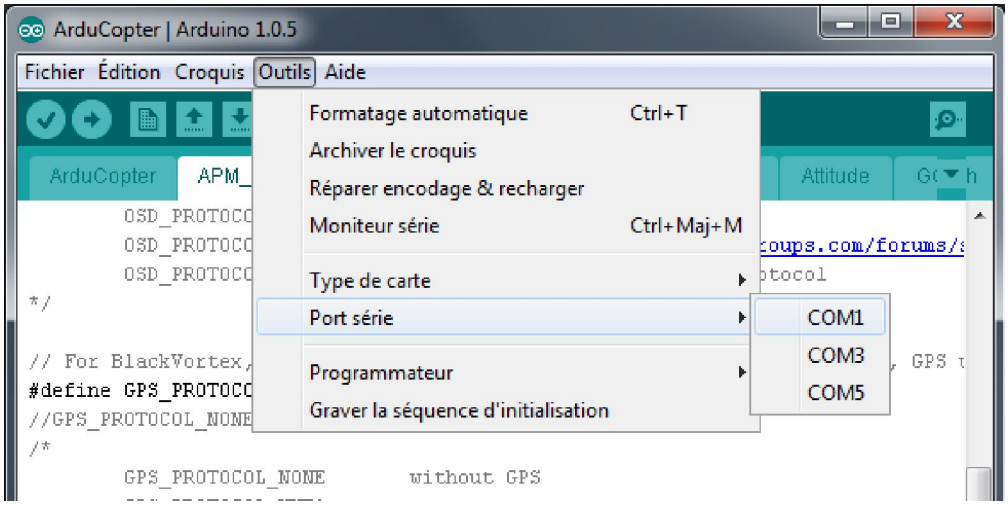
-the serial port

Now, connect the flight controller to your PC using a miniUSB-USB cable.

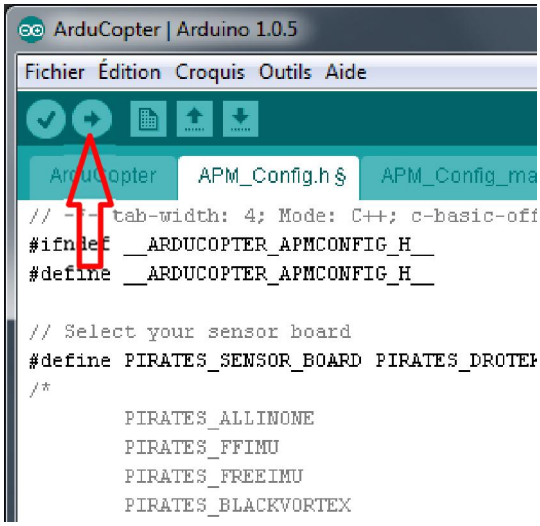
For Windows users, on first plug, a new device should be automatically detected and installed.



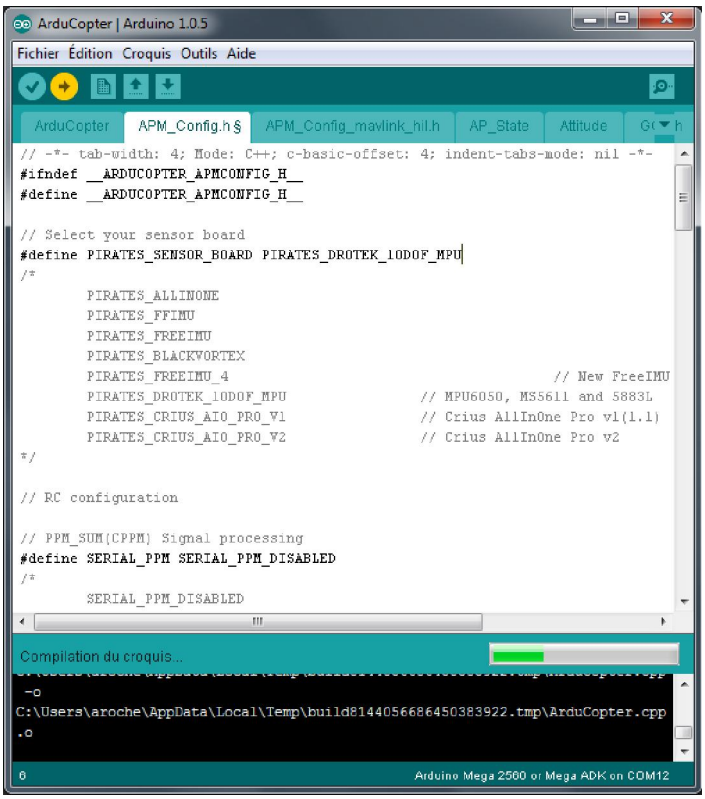
Once the message "*device successfully installed and ready to use*" is displayed, you can select the relevant COM port in Arduino Tools menu:



Now click on the « upload » button:



This will compile and upload the code into the flight controller. You can see compilation progress bar at the bottom-right of the Arduino window.



Once compilation complete, the code will be automatically uploaded into the flight controller.

The red and green LEDs on the flight controller will blink rapidly until “Done uploading” message appears at the bottom-left of the window.

Congratulations, you’ve successfully setup your flight controller!

Using MegaPirateNG GUI

MegaPirateNG can be used with the "Ardupilot MegaPlanner 10" GUI (Graphical User Interface) which helps the user to setup:
-sensors recognition
-accelerometer/compass calibration
-PIDs setup
-rx channels calibration

You can refer to the "Ardupilot MegaPlanner" dedicated section "Configuration via GUI", available here:
https://code.google.com/p/ardupilot-mega/wiki/Mission

3. HARWARE SETUP

Now your flight controller is ready on the software side, let's see how to set it up on your flying model.

SECURITY WARNING: make sure the propellers are OFF the motors before testing.

Setup on your frame

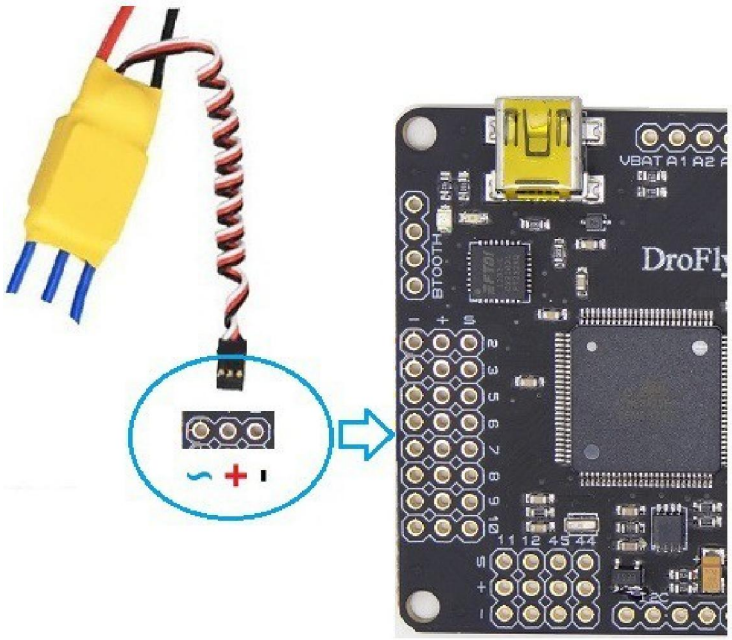
First, you need to identify the front of your flight controller.
If you've followed this guide, the front of the FC is the side where the micro-USB port is located.
Anyway, you can easily identify flight controller orientation using GUI.

Please make sure your flight controller is securely attached to your model frame and make sure propellers are off the motors. You can refer to your frame user manual.

Connecting flight controller

a. To BEC

Flight controller must be powered by ESC BEC (5V) on connector n°2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 44 or 45.



b. To receiver

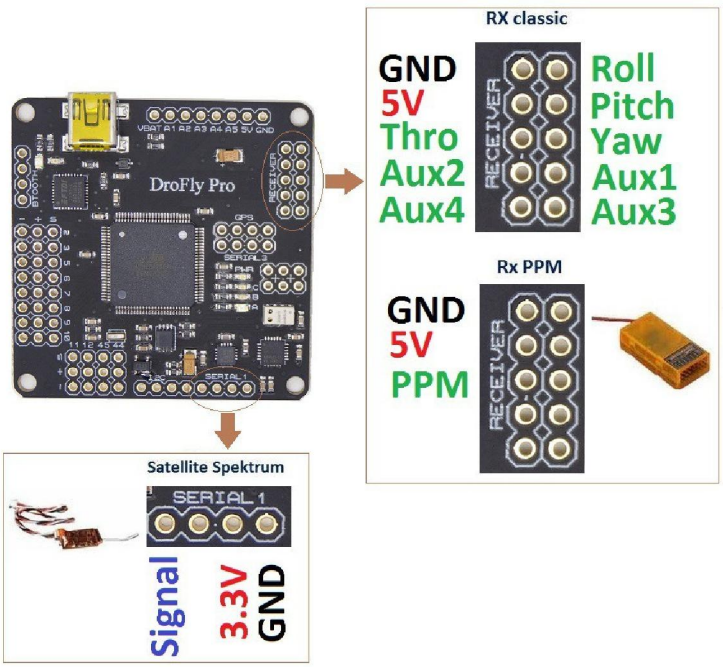
Here are 2 ways to connect your receiver to the flight controller depending of your harware:

-classic receiver: each port of the receiver is connected to the flight controller. You can connect up to 8 channels.
Define this lines:
#define SERIAL_PPM SERIAL_PPM_DISABLED

-PPM receiver: with PPM enabled receiver one jumper servo cable handles all the channels (number of channels depends of your Tx/Rx hardware).
You need to enable PPM receiver functionality in APM_Config.h file.
Define this lines:
#define SERIAL_PPM SERIAL_PPM_ENABLED

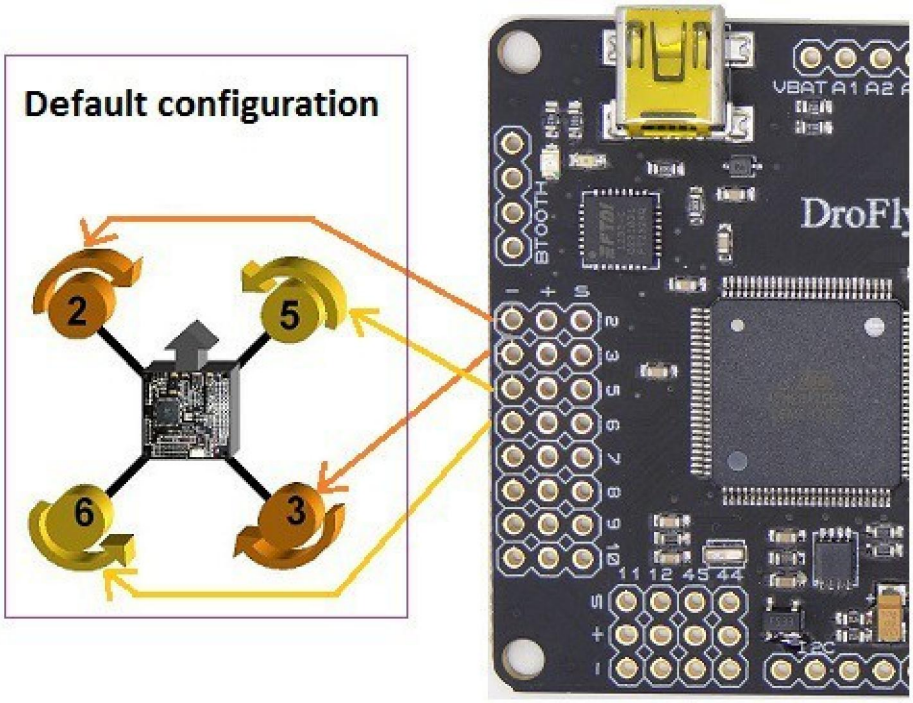
You can choose between many set of TX/RX channels map :
- TX_set1 for Graupner and Spektrum
  PITCH,YAW,THROTTLE,ROLL,AUX1,AUX2,CAMPITCH,CAMROLL
- TX_standard for standard PPM layout Futaba/Robbe/Hitec/Sanwa
  ROLL,PITCH,THROTTLE,YAW,MODE,AUX2,CAMPITCH,CAMROLL
- TX_set2 for some Hitec/Sanwa/others
  PITCH,ROLL,THROTTLE,YAW,AUX1,AUX2,CAMPITCH,CAMROLL
- TX_mwi for MultiWii layout
  ROLL,THROTTLE,PITCH,YAW,AUX1,AUX2,CAMPITCH,CAMROLL
- TX_JR for JR layout
  FLAPS:MODE, GEAR:SAVE TRIMM = apm ch7

You can choose your TX/RX channels map by setting the following line with the corresponding option as above :
#define TX_CHANNEL_SET TX_standard



c. To ESCs/Motors

MultiWii code can handle various types of flying models with different number of motors and servos.
Please refer to section 2.3.a to identify which type of model you're flying then connect ESCs accordingly to the flight controller.



5. ADDITIONAL MODULES

GPS

You can connect a serial GPS module to the serial port 2 of the Drofly Pro.

With our Ublox GPS module, you have to setup the GPS_PROTOCOL to GPS_PROTOCOL_UBLOX and set the SERIAL2_BAUD to the good baudrate.